

FY 1976, 1977 and 1977 RDT&E DESCRIPTIVE SUMMARY

Program Element # 35158F

Title: Satellite Data System

Category Intelligence and Communications

Budget Activity #4 - Military Astronautics and Related Equipment

BACKGROUND AND DESCRIPTION: The Satellite Data System (SDS) is designed to provide critical transpolar, two-way, real-time command, control and communications for Strategic Air Command Single Integrated Operational Plan (SIOP) forces. Since a synchronous equatorial orbit cannot provide communications coverage over the polar regions above 70 degrees North Latitude, a highly inclined elliptical orbit was selected to provide

The SDS is an integral part of the Air Force Satellite Communications (AFSATCOM) system which includes the Air Force Ultra High Frequency (UHF) communications capability on the synchronous equatorial Fleet Satellite Communications (FLTSATCOM) program, piggy-back transponders on selected host satellites, and airborne/ground radio terminals. As such, the SDS will complement the FLTSATCOM program by providing the requisite polar UHF capability. Additionally, the SDS will support the Air Force Satellite Control Facility (AFSCF) requirement for reliable two-way high data rate, S-band communications between the AFSCF remote tracking station at Thule, Greenland and the CONUS.

] The direct benefits derived from the SDS capabilities will be the reliable and secure direct communications linkage over the polar regions to provide greatly improved command and control of SIOP forces, eliminate the dependence on vulnerable undersea cables to the Thule station.

RELATED ACTIVITIES: The Space segment of the FLTSATCOM will be developed, procured and launched under FLTSATCOM Program Element, PE 33109N. The Air Force aircraft and ground UHF radio terminals required for operation with the FLTSATCOM and SDS satellites will be procured within the AFSATCOM Program Element, PE 33601F. The AFSCF stations are funded under the AFSCF Program Element, PE 35110F.

WORK PERFORMED BY: Headquarters, Air Force Systems Command, Space and Missile Systems Organization (SAMSO), Los Angeles, California, is responsible for the Satellite Data System. The primary contractor is Hughes Aircraft Company, El Segundo, California. General Systems Engineering and Technical Direction (GSE/TD) is performed by The Aerospace Corporation, El Segundo, California.

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PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1974 and Prior Accomplishments: The technology phase of the program was completed in FY 1971. This was followed by a contract definition phase in FY 1972 which established the system configuration. The system acquisition contractor was selected by competitive source selection and a system development contract was awarded in June 1972. The system critical design review (CDR) was successfully completed in March of 1974 with all critical specifications being met or exceeded. The structural and qualification model spacecraft and the initial flight vehicle (F-1) are being procured incrementally with RDT&E funds. A production option to the development contract was exercised beginning in FY 1974. This option provides for the fabrication, assembly, and test of the first production model spacecraft (F-2). The development and production schedules are phased to achieve the required delivery, launch and system operational dates. The key to this phased schedule is that subsystem lead-time is essential to achieve an orderly spacecraft production flow. Critical development and qualification activity is completed before subsystem/system fabrication and assembly is begun and all development activity is completed before production is started at each critical stage. The communications subsystems engineering models were completed by November 1973. Fabrication of the structural model spacecraft was completed and tests were begun in the fourth quarter FY74. Fabrication and assembly of the qualification model spacecraft was started during FY 1974.

2. FY 1975 Program: Structural model testing and subsystem level qualification testing will be completed during this period. Due to industry wide delays in delivery of high-reliability electronic piece parts, the qualification model and development spacecraft (F-1) assembly and test schedules have been altered. System level qualification testing is now scheduled to begin during the third quarter FY75.

Production of the back-up flight vehicle (F-3) will be initiated in FY 1975. Launch vehicle integration and spacecraft software development will be continued during this fiscal year.

3. Planned Program for FY 1976 and 77: During FY 1976, system level qualification will be completed. The back-up flight vehicle (F-3) will be delivered.

4. Planned Program for FY 1977: Activities planned during this period include sustaining engineering support, initiation of study and preliminary design to improve follow-on satellites for survivability, reliability, and performance. Design work to convert the satellites to launch on the space shuttle will also be initiated.

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5. Program to Completion: This is a continuing program. As an integral part of the AFSATCOM System, the program will continue to provide critical communications coverage and be totally compatible with the AFSATCOM aircraft and ground radio terminals. Sustaining engineering support will be required to maintain design compatibility; to incorporate improvements for survivability, reliability and capability and to provide additional replenishment spacecraft.

6. Milestones:

Date

Estimated Cumulative RDT&E Cost to Reach Milestones (\$ In Millions)

a. System PRD	Mar 1973	49.6
b. System CDR	Mar 1974	96.6
c. First Article Config. Insp.		
d. Launch First Spacecraft		
e. Launch Second Spacecraft		
f. Full Operational Capability		

RESOURCES: (\$ In Millions)

	<u>FY74</u>	<u>FY75</u>	<u>FY76</u>	<u>FY77</u>	<u>FY78</u>	<u>Additional to Completion</u>	<u>Total Estimated Cost</u>
RDT&E: Funds	41.9	36.5	30.2	4.0	10.4	continuing	Not applicable
*Quantities							
Flight Model Spacecraft							1
T-IIIB/Agna Launch Vehicles							1

*These quantities will be procured over the lifetime of the program.

Missile Procurement:

Funds (3020)	39.6	42.9	9.6	13.4	9.6	continuing	Not applicable
Quantities							
Flight Model Spacecraft							1**
T-IIIB/Agna Launch Vehicles							1**

**The Qualification Spacecraft will be refurbished and used as a backup flight spare.

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Test and Evaluation Data

1. Development Test and Evaluation: The development contractor for the Satellite Data System (SDS) is Hughes Aircraft Company, El Segundo, California. The contractor is conducting the development program in support of satellite launches to establish the initial orbital deployment and achieve an Initial Operational Capability. The first satellite to be launched (F-1) is being funded entirely within the development program. The second flight spacecraft (F-2) is the first vehicle being funded under the production program. The development hardware includes engineering models of the communication subsystems, a structural model spacecraft (X-1) and a full-up qualification model spacecraft (Y-1). Development tests of the communication subsystems engineering models were completed in November 1973 with all critical performance specifications being met or exceeded. The X-1 spacecraft has been fabricated, assembled and is undergoing testing.

System level qualification is designed to demonstrate design integrity and performance to specification via a series of tests including shock, acoustic, model survey, thermal, electromagnetic interference (EMI), solar-thermal vacuum, and integrated system test. Subsystem level qualification tests are in progress and will be completed prior to initiation of system level qualification testing. Reliability (life) tests of critical components will continue throughout the development program. The F-1 spacecraft will undergo acceptance test during the

The Y-1 spacecraft is a full configured spacecraft which will be refurbished, as required, and used as a back-up flight vehicle (F-4).

2. Operational Test and Evaluation: OT&E is accomplished on the individual systems supported by this program element, such as: AFSATCOM, PE 33601F and Satellite Control Facility, PE 35110F.

3. Systems Characteristics:

a. UHF mission characteristics

~~240-400 MHz~~

~~12 - 5 KHz channels, 75 BPS, two-way teletype~~

Anti-Jam capability -

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b. AFSCF Mission Characteristics

~~1.76 - 2.3~~ GHz (S-Band)
Data pass ~~- 256 KBs, 32 KBs~~

c. ~~64° elliptical~~ orbit, ~~12 hr~~ period, transpolar coverage.

d. Orbital life Mean Mission Duration (MMD) -

Mission characteristics will be validated during DT&E. Operational characteristics and orbit performance will be demonstrated during OT&E.